AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Cancelled)

2. (Cancelled)

3.   (Original) A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals.

4.   (Currently Amended) A wireless communication system according to claim 3 any one of claims 1 through 3, wherein said means for performing nulling uses a complex conjugate transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

5.   (Currently Amended) A wireless communication system according to claim 3 any one of claims 1 through 3, wherein said transmitted signals are demodulated in a descending

order from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted

sequence transmitted from a first transmitted antenna, based on the nulled signals.

6. (Currently Amended) A wireless communication system according to ~~claim 3~~ any one

~~of claims 1 through 5~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said

channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as

elements by a complex conjugate transposed matrix of said Q matrix and outputting the product

as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a

likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted

sequence, based on said converted signal and said R matrix.

7. (Currently Amended) A wireless communication system according to claim 3 ~~any one~~

~~of 1 through 5~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel

coefficients between said between said reception antennas and said transmission antennas based

on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

8. (Currently Amended) A wireless communication system according to claim 3 ~~any one of claims 1 through 5~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

9. (Currently Amended) A wireless communication system according to claim 3 any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates.

10. (Currently Amended) A wireless communication system according to ~~claim 3~~ any-one ~~of claims 1 through 5~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

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a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

11. (Currently Amended) A wireless communication system according to <u>claim 3</u> any one of claims 1 through 5, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

12. (Currently Amended) A wireless communication system according to claim 3 ~~any one~~

~~of claims 1 through 5~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said

channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as

elements by a complex conjugate transposed matrix of said Q matrix and outputting the product

as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is

an integer ranging from 1 to M) converted signals based on said received signals and outputting

the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates

for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a

likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted

sequence, based on said converted signal, said R matrix, said transmitted sequence candidates,

and said symbol candidates.

13. (Currently Amended) A wireless communication system according to claim 3 ~~any one~~

~~of claims 1 through 5~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

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a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

14. (Currently Amended) A wireless communication system according to claim 6 ~~any one of claims 6 through 13~~, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

15. (Currently Amended) A wireless communication system according to claim 6 ~~any one of claims 6 through 13~~, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage

comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating

said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is

an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the

transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1

transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from

the likelihood calculator group in the pth stage and said transmitted symbol candidates.

16. (Currently Amended) A wireless communication system according to <u>claim 6</u> any one

of claims 6 through 13, wherein said transmitted sequence estimator comprises likelihood

calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M

stages.

17. (Currently Amended) A wireless communication system according to <u>claim 6</u> any one

of claims 6 through 13, wherein said transmitted sequence estimator comprises likelihood

calculator groups in N stages (N is an integer of 2 or greater) and signal selector groups in the M

stages.

18. (Currently Amended) A wireless communication system according to <u>claim 6</u> any one

of claims 6 through 13, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects and outputs a most likely

transmitted sequence.

19. (Currently Amended) A wireless communication system according to claim 6 ~~any one~~

~~of claims 6 through 13~~, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence

and outputs a likelihood for said sequence.

20. (Currently Amended) A wireless communication system according to claim 6 ~~any one~~

~~of claims 6 through 13~~, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence

and outputs a likelihood for a bit sequence transmitted by said sequence.

21. (Currently Amended) A wireless communication system according to claim 6 ~~any one~~

~~of claims 6 through 13~~, wherein said transmitted sequence estimator includes a likelihood

calculator for generating a converted signal replica using elements of said R matrix and

calculating the likelihood using a physical quantity measured from said converted signal replica

and said received signals.

22. (Original) A wireless communication system according to claim 21, wherein said

likelihood calculator calculates the likelihood using a squared Euclidean distance between said

received signals and said converted signal replica.

23. (Original) A wireless communication system according to claim 21, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance between said received signals and said converted signal replica.

24. (Currently Amended) A wireless communication system according to claim 7 ~~any one of claims 7, 10, 12, 13~~, wherein said transmitted symbol candidate selector employs a linear filter.

25. (Currently Amended) A wireless communication system according to claim 7 ~~any one of claims 7, 10, 12, 13~~, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

26. (Currently Amended) A wireless communication system according to claim 8 ~~any one of claims 8, 10, 11, 13~~, wherein said priority determiner employs received electric power of each of said transmitted sequences.

27. (Currently Amended) A wireless communication system according to claim 8 ~~any one of claims 8, 10, 11, 13~~, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

28. (Currently Amended) A wireless communication system according to claim 8 ~~any one of claims 8, 10, 11, 13~~, wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

29. (Currently Amended) A wireless communication system according to claim 9 ~~any one of claims 9, 11, 12, and 13~~, wherein said transmitted sequence candidate selector employs a linear filter.

30. (Currently Amended) A wireless communication system according to claim 9 ~~any one of claims 9, 11, 12, and 13~~, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

31. (Currently Amended) A wireless communication system according to claim 8 ~~any one of claims 8, 10, 11, 13~~, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

32. (Original) A wireless communication system according to claim 31, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

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33. (Currently Amended) A wireless communication system according to ~~claim 14 any one of claims 14 through 20~~, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said signal selector determines the number of error signals and transmitted symbol candidates which are output depending on the modulating process for the transmission antenna to be processed by a likelihood calculator in a next stage.

34. (Currently Amended) A wireless communication system according to ~~claim 6 any one of claims 6 through 13~~, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

35. (Original) A wireless communication system according to claim 34, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

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wherein said likelihood calculator calculates the likelihood using said provisional squared

Euclidean distance if either one of said first and second squared Euclidean distances is not

output.

36. (Currently Amended) A wireless communication system according to claim 34 ~~claim 34 or 35~~, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

37. (Currently Amended) A wireless communication system according to claim 8 ~~any one of claims 8, 10, 11, 13~~, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

38. (Currently Amended) A wireless communication system according to claim 6 ~~any one of claims 6 through 13~~, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

39. (Currently Amended) A wireless communication system according to claim 6 ~~any one of claims 6 through 13~~, wherein said transmitting apparatus spreads in advance and then

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transmits the transmitted signals, and said QH processor multiplies the received signal vector

having said received signals after being despread as elements by the complex conjugate

transposed matrix of said Q matrix and outputs the product as the converted signal.

40. (Original) A wireless communication system for receiving and demodulating

transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater)

transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said

receiving apparatus comprising:

means for using a Euclidean distance converted by performing a given processing

operation on a squared Euclidean distance.

41. (Original) A wireless communication system for receiving and demodulating

transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater)

transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said

receiving apparatus comprising:

an accumulator for accumulating a first squared Euclidean distance at a bit 0 and a

second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean

distance based on the accumulated squared Euclidean distances; and

means for calculating a likelihood using said provisional squared Euclidean distance if

either one of said first and second squared Euclidean distances is not output.

42. (Original) A wireless communication system according to claim 41, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

43. (Original) A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for demodulating said transmitted signals based on the nulled signals.

44. (Original) A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for calculating and outputting a likelihood for said transmitted signals based on the nulled signals.

45. (Original) A receiving apparatus having N (N is an integer of 2 or greater) reception

antennas in a wireless communication system for receiving and demodulating transmitted signals

from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas,

said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals,

using a channel matrix having as elements channel coefficients between said reception antennas

and said transmission antennas; and

means for outputting a likelihood for bits of said transmitted signals based on the nulled

signals.

46. (Currently Amended) A receiving apparatus according to <u>claim 43</u> ~~any one of claims~~

~~43 through~~ 45, wherein said means for performing nulling uses a complex conjugate transposed

matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

47. (Currently Amended) A receiving apparatus according to <u>claim 43</u> ~~any one of claims~~

~~43 through~~ 45, wherein said transmitted signals are demodulated in a descending order from a

transmitted sequence transmitted from an Mth transmitted antenna to a transmitted sequence

transmitted from a first transmitted antenna, based on the nulled signals.

48. (Currently Amended) A receiving apparatus according to <u>claim 43</u> ~~any one of claims~~

~~43 through~~ 47, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

49. (Currently Amended) A receiving apparatus according to <u>claim 43</u> ~~any one of claims 43 through 47~~, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

50. (Currently Amended) A receiving apparatus according to <u>claim 43</u> ~~any one of claims 43 through 47~~, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

51. (Currently Amended) A receiving apparatus according to claim 43 ~~any one of claims 43 through 47~~, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a

likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted

sequence, based on said converted signal, said R matrix, and said transmitted sequence

candidates.

52. (Currently Amended) A receiving apparatus according to <u>claim 43</u> ~~any one of claims~~

~~43 through 47~~, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a priority determiner for determining priorities between transmission sequences

transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated

by said channel coefficient estimator and the priorities determined by said priority determiner,

and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and

outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as

elements by a complex conjugate transposed matrix of said Q matrix and outputting the product

as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

53. (Currently Amended) A receiving apparatus according to claim 43 ~~any one of claims 43 through 47~~, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said ~~between said~~ reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

54. (Currently Amended) A receiving apparatus according to <u>claim 43</u> ~~any one of claims 43 through 47~~, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said

channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as

elements by a complex conjugate transposed matrix of said Q matrix and outputting the product

as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is

an integer ranging from 1 to M) converted signals based on said received signals and outputting

the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates

for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a

likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted

sequence, based on said converted signal, said R matrix, said transmitted sequence candidates,

and said symbol candidates.

55. (Currently Amended) A receiving apparatus according to claim 43 ~~any one of claims~~

~~43 through 47~~, comprising:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a priority determiner for determining priorities between transmission sequences

transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

56. (Currently Amended) A receiving apparatus according to claim 48 ~~any one of claims 48 through 55~~, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

57. (Currently Amended) A receiving apparatus according to claim 48 ~~any one of claims 48 through 55~~, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is

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an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the

transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1

transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from

the likelihood calculator group in the pth stage and said transmitted symbol candidates.

58. (Currently Amended) A receiving apparatus according to <u>claim 48</u> ~~any one of claims 48 through 55~~, wherein said transmitted sequence estimator comprises likelihood calculator

groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

59. (Currently Amended) A receiving apparatus according to <u>claim 48</u> ~~any one of claims 48 through 55~~, wherein said transmitted sequence estimator comprises likelihood calculator

groups in N stages (N is an integer of 2 or greater) and signal selector groups in the M stages.

60. (Currently Amended) A receiving apparatus according to <u>claim 48</u> ~~any one of claims 48 through 55~~, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects and outputs a most likely

transmitted sequence.

61. (Currently Amended) A receiving apparatus according to <u>claim 48</u> ~~any one of claims 48 through 55~~, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for said sequence.

62. A receiving apparatus according to ~~claim 48~~ any one of claims 48 through 55, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for a bit sequence transmitted by said sequence.

63. (Currently Amended) A receiving apparatus according to ~~claim 48~~ any one of claims 48 through 55, wherein said transmitted sequence estimator includes a likelihood calculator for generating a converted signal replica using elements of said R matrix and calculating the likelihood using a physical quantity measured from said converted signal replica and said received signals.

64. (Original) A receiving apparatus according to claim 63, wherein said likelihood calculator calculates the likelihood using a squared Euclidean distance between said received signals and said converted signal replica.

65. (Original) A receiving apparatus according to claim 63, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance between said received signals and said converted signal replica.

66. (Currently Amended) A receiving apparatus according to <u>claim 49</u> ~~any one of claims 49, 51, 54, 55~~, wherein said transmitted symbol candidate selector employs a linear filter.

67. (Currently Amended) A receiving apparatus according to <u>claim 49</u> ~~any one of claims 49, 51, 54, 55~~, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

68. (Currently Amended) A receiving apparatus according to <u>claim 50</u> ~~any one of claims 50, 52, 53, 55~~, wherein said priority determiner employs received electric power of each of said transmitted sequences.

69. (Currently Amended) A receiving apparatus according to <u>claim 50</u> ~~any one of claims 50, 52, 53, 55~~, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

70. (Currently Amended) A receiving apparatus according to <u>claim 50</u> ~~any one of claims 50, 52, 53, 55,~~ wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

71. (Currently Amended) A receiving apparatus according to <u>claim 51</u> ~~any one of claims 51, 53, 54, 55~~, wherein said transmitted sequence candidate selector employs a linear filter.

72. (Currently Amended) A receiving apparatus according to <u>claim 51</u> ~~any one of claims 51, 53, 54, 55~~, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

73. (Currently Amended) A receiving apparatus according to <u>claim 50</u> ~~any one of claims 50, 52, 53, 54~~, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

74. (Original) A receiving apparatus according to claim 73, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

75. (Currently Amended) A receiving apparatus according to <u>claim 56</u> ~~any one of claims 56 through 62~~, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said signal selector determines the number of

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error signals and transmitted symbol candidates which are output depending on the modulating

process for the transmission antenna to be processed by a likelihood calculator in a next stage.

76. (Currently Amended) A receiving apparatus according to <u>claim 48</u> any one of claims

48 through 55, wherein said transmitted sequence estimator includes a likelihood calculator for

calculating the likelihood using the difference between a squared Euclidean distance between a

converted signal replica at a bit 0 and the received signals and a squared Euclidean distance

between a converted signal replica at a bit 1 and the received signals.

77. (Original) A receiving apparatus according to claim 76, wherein said transmitted

sequence estimator includes an accumulator for accumulating a first squared Euclidean distance

between a converted signal replica at a bit 0 and the received signals and a second squared

Euclidean distance between a converted signal replica at a bit 1 and the received signals, and

outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean

distances; and

wherein said likelihood calculator calculates the likelihood using said provisional squared

Euclidean distance if either one of said first and second squared Euclidean distances is not

output.

78. (Currently Amended) A receiving apparatus according to claim 76 or 77, wherein

said squared Euclidean distance is replaced with a Euclidean distance which is converted by

performing a given functional operation on said squared Euclidean distance.

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79. A receiving apparatus according to claim 46 ~~any one of claims 46, 48, 49, 51~~,

wherein data sequences transmitted from M transmission antennas are modulated respectively by

independent modulating processes, and said modulating processes have respective independent

coding ratios, and said priority determiner determines said priorities based on the coding ratios

for the respective transmission antennas.

80. (Currently Amended) A receiving apparatus according to claim 48 ~~any one of claims~~

~~48 through 55~~, wherein said channel coefficient estimator estimates, in the transmitting apparatus

having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients

using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the

transmission antennas and known to the receiving apparatus.

81. (Currently Amended) A receiving apparatus according to claim 48 ~~any one of claims~~

~~48 through 55~~, wherein said transmitting apparatus spreads in advance and then transmits the

transmitted signals, and said QH processor multiplies the received signal vector having said

received signals after being despread as elements by the complex conjugate transposed matrix of

said Q matrix and outputs the product as the converted signal.

82. (Original) A receiving apparatus having N (N is an integer of 2 or greater) reception

antennas in a wireless communication system for receiving and demodulating transmitted signals

from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance.

83. (Original) A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

an accumulator for accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

means for calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

84. (Original) A recording apparatus according to claim 83, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

85. (Original) A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas,

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in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said

demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a

channel matrix having as elements channel coefficients between said reception antennas and said

transmission antennas; and

demodulating said transmitted signals based on the nulled signals.

86. (Original) A demodulating method of receiving and demodulating transmitted signals

from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas,

in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said

demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a

channel matrix having as elements channel coefficients between said reception antennas and said

transmission antennas; and

calculating and outputting a likelihood for said transmitted signals based on the nulled

signals.

87. (Original) A demodulating method of receiving and demodulating transmitted signals

from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas,

in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said

demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a

channel matrix having as elements channel coefficients between said reception antennas and said

transmission antennas; and

outputting a likelihood for bits of said transmitted signals based on the nulled signals.

88. (Currently Amended) A demodulating method according to <u>claim 85</u> any one of

claims 85 through 87, wherein said step of performing nulling uses a complex conjugate

transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

89. (Currently Amended) A demodulating method according to <u>claim 85</u> any one of

claims 85 through 87, wherein said transmitted signals are demodulated in a descending order

from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted

sequence transmitted from a first transmitted antenna, based on the nulled signals.

90. (Currently Amended) A demodulating method according to <u>claim 85</u> any one of

claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said

channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

91. (Currently Amended) A demodulating method according to claim 85 ~~any one of claims 85 through 89~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

92. (Currently Amended) A demodulating method according to <u>claim 85</u> ~~any one of~~ ~~claims 85 through 89~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said

transmitted sequence, based on the output from said transmitted sequence estimator and said

priorities.

93. (Currently Amended) A demodulating method according to claim 85 ~~any one of~~

~~claims 85 through 89~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said

channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as

elements by a complex conjugate transposed matrix of said Q matrix and outputting the product

as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is

an integer ranging from 1 to M) converted signals based on said received signals and outputting

the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a

likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted

sequence, based on said converted signal, said R matrix, and said transmitted sequence

candidates.

94. (Currently Amended) A demodulating method according to <u>claim 85</u> ~~any one of~~

~~claims 85 through 89~~, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a priority determiner for determining priorities between transmission sequences

transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated

by said channel coefficient estimator and the priorities determined by said priority determiner,

and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and

outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as

elements by a complex conjugate transposed matrix of said Q matrix and outputting the product

as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a

demodulated sequence based on said received signals, and outputting a transmitted symbol

candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a

likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted

sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate;

and

a restorer for restoring and outputting at least one of said transmitted sequence, the

likelihood for said transmitted sequence, and the likelihood for bits transmitted by said

transmitted sequence, based on the output from said transmitted sequence estimator and said

priorities.

95. (Currently Amended) A demodulating method according to <u>claim 85</u> any one of

claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients

between said between said reception antennas and said transmission antennas based on said

received signals;

a priority determiner for determining priorities between transmission sequences

transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated

by said channel coefficient estimator and the priorities determined by said priority determiner,

and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and

outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as

elements by a complex conjugate transposed matrix of said Q matrix and outputting the product

as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

96. (Currently Amended) A demodulating method according to claim 85-any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, said transmitted sequence candidates, and said symbol candidates.

97. (Currently Amended) A demodulating method according to <u>claim 85</u> any one of claims 85 through 89, wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

98. (Currently Amended) A demodulating method according to <u>claim 90</u> ~~any one of claims 90 through 97~~, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

99. (Currently Amended) A demodulating method according to claim 90 ~~any one of claims 90 through 97~~, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1 transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

100. (Currently Amended) A demodulating method according to ~~any one of claims 90~~

~~through 97~~, wherein said transmitted sequence estimator comprises likelihood calculator groups

in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

101. (Currently Amended) A demodulating method according to <u>claim 90</u> ~~any one of~~

~~claims 90 through 97~~, wherein said transmitted sequence estimator comprises likelihood

calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M

stages.

102. (Currently Amended) A demodulating method according to <u>claim 90</u> ~~any one of~~

~~claims 90 through 97~~, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects and outputs a most likely

transmitted sequence.

103. (Currently Amended) A demodulating method according to <u>claim 90</u> ~~any one of~~

~~claims 90 through 97~~, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence

and outputs a likelihood for said sequence.

104. (Currently Amended) A demodulating method according to <u>claim 90</u> ~~any one of~~

~~claims 90 through 97~~, wherein said transmitted sequence estimator includes signal selectors in a

plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence

and outputs a likelihood for a bit sequence transmitted by said sequence.

105. (Currently Amended) A demodulating method according to <u>claim 90</u> any one of

~~claims 90 through 97~~, wherein said transmitted sequence estimator includes a likelihood

calculator for generating a converted signal replica using elements of said R matrix and

calculating the likelihood using a physical quantity measured from said converted signal replica

and said received signals.

106. (Original) A demodulating method according to claim 105, wherein said likelihood

calculator calculates the likelihood using a squared Euclidean distance between said received

signals and said converted signal replica.

107. (Original) A demodulating method according to claim 105, wherein said likelihood

calculator calculates the likelihood using a Euclidean distance converted by performing a given

processing operation on a squared Euclidean distance between said received signals and said

converted signal replica.

108. (Currently Amended) A demodulating method according to <u>claim 91</u> any one of

~~claims 91, 94, 96, 97~~, wherein said transmitted symbol candidate selector employs a linear filter.

109. (Currently Amended) A demodulating method according to <u>claim 91</u> ~~any one of claims 91, 94, 96, 97~~, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

110. (Currently Amended) A demodulating method according to <u>claim 92</u> ~~any one of claims 92, 94, 95, 97~~, wherein said priority determiner employs received electric power of each of said transmitted sequences.

111. (Currently Amended) A demodulating method according to <u>claim 92</u> ~~any one of claims 92, 94, 95, 97~~, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

112. (Currently Amended) A demodulating method according to <u>claim 92</u> ~~any one of claims 92, 94, 95, 97~~, wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

113. (Currently Amended) A demodulating method according to <u>claim 93</u> ~~any one of claims 93, 95, 96, 97~~, wherein said transmitted sequence candidate selector employs a linear filter.

114. (Currently Amended) A demodulating method according to <u>claim 93</u> ~~any one of~~

~~claims 93, 95, 96, 97~~, wherein said transmitted sequence candidate selector employs maximum

likelihood estimation.

115. (Currently Amended) A demodulating method according to <u>claim 92</u> ~~any one of~~

~~claims 92, 94, 95, 97~~, wherein data sequences transmitted from M transmission antennas are

modulated respectively by independent modulating processes, and said modulating processes

have respective different numbers of signal points, and said priority determiner determines said

priorities based on said modulating processes for the respective transmission antennas.

116. (Original) A demodulating method according to claim 115, wherein a priority is

given to an antenna which has sequences of a lower modulation multi-valued number among said

transmission antennas.

117. (Currently Amended) A demodulating method according to <u>claim 98</u> ~~any one of~~

~~claims 98 through 104~~, wherein data sequences transmitted from M transmission antennas are

modulated respectively by independent modulating processes, and said modulating processes

have respective different numbers of signal points, and said signal selector determines the

number of error signals and transmitted symbol candidates which are output depending on the

modulating process for the transmission antenna to be processed by a likelihood calculator in a

next stage.

118. (Currently Amended) A demodulating method according to <u>claim 90</u> ~~any one of claims 90 through 97~~, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

119. (Original) A demodulating method according to claim 118, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

120. (Currently Amended) A demodulating method according to <u>claim 118</u> ~~claim 118 or 119~~, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

121. (Currently Amended) A demodulating method according to <u>claim 92</u> ~~any one of claims 92, 94, 95, 97~~, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

122. (Currently Amended) A demodulating method according to claim 90 ~~any one of claims 90 through 97~~, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

123. (Currently Amended) A demodulating method according to claim 90 ~~any one of claims 90 through 97~~, wherein said transmitting apparatus spreads in advance and then transmits the transmitted signals, and said QH processor multiplies the received signal vector having said received signals after being despread as elements by the complex conjugate transposed matrix of said Q matrix and outputs the product as the converted signal.

124. (Original) A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the step of:

using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance.

125. (Original) A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission

antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

126. (Original) A demodulating method according to claim 125, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

127. (Original) A program for a demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said program enabling a computer to perform:

a process of performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

a process of demodulating said transmitted signals based on the nulled signals.

128. (Original) A program for a demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said program enabling a computer to perform:

a process of performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

a process of calculating and outputting a likelihood for said transmitted signals based on the nulled signals.

129. (Original) A program for a demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said program enabling a computer to perform:

a process of performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

a process of outputting a likelihood for bits of said transmitted signals based on the nulled signals.